O isotope analysis of kerogen by secondary ion mass spectrometry

R. TARTESE[12*], M. CHAUSSIDON[3], A. GURENKO[4] AND F. ROBERT[1]

[1]IMPMC, MNHN, 75005 Paris, France
[2]The Open University, Milton Keynes, MK7 6AA, UK
(*correspondence: romain.tartese@gmail.com)
[3]IPGP, UMR CNRS 7154, 75238 Paris Cedex 05, France
[4]CRPG, 54501 Vandoeuvre-lès-Nancy Cedex, France

The isotopic composition of tracers such as O and Si in sedimentary rocks have been used as proxies to reconstruct oceanic temperature throughout the Earth's history. However, great controversies still remain, notably regarding possible variations of the isotopic composition of the ocean through time, or the preservation of isotopic signatures after deposition of sedimentary rocks [1-4]. Direct O isotope measurements of kerogens preserved in Archean cherts have the potential to provide crucial pieces of information to this ongoing debate. However, such *in situ* analyses have been hampered by the lack of standards to correct for instrumental mass fractionation (IMF) inherent to ion probe analysis.

We have set up a protocol to perform such measurements. Analyses were carried out with the Cameca ims-1280 HR ion probe using a ~10 nA Cs^+ beam. Isotopes of ^{16}O and ^{18}O were first collected in multicollection, followed by $^{12}C^1H$, ^{16}O, ^{28}Si, ^{32}S and $^{56}Fe^{16}O$ in order to identify contamination by residual silica, sulfurs, chromites or Fe-oxides. The Blind Canyon coal, which contains 80.7 wt.% C, 5.8 wt.% H, 11.6 wt.% O and less than 5 wt.% ash (http://web.anl.gov/PCS/), and for which $\delta^{18}O$ has been measured by fluorination, was used as our primary standard. Repeated ion probe analyses yielded homogeneous $\delta^{18}O$ values that corresponded to an IMF of ~33 ± 1.3‰ (2SE, n = 28). Once corrected for IMF, analyses of a coal from the Blanzy basin (France) and of Baltic amber (both used as $\delta^{13}C$ standards [5]) yielded $\delta^{18}O$ values of 10.1 ± 1.1‰ (2SE, n = 5) and 13.9 ± 0.6‰ (2SE, n = 3), respectively, which are typical of $\delta^{18}O$ values measured in these types of materials [6-7]. Kerogens extracted from 45 Myr to 3.4 Gyr old cherts have the potential to record evolution of the O isotope composition of seawater through geological time. The results of their ongoing analysis will be presented at the meeting.

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